R0898-7329

SURF ZONE TECHNOLOGY

ENABLING POWER PROJECTION FROM THE SEA

Naval Sea Systems Command

NSWC Naval Surface Warfare Center
A TRADITION OF EXCELLENCE

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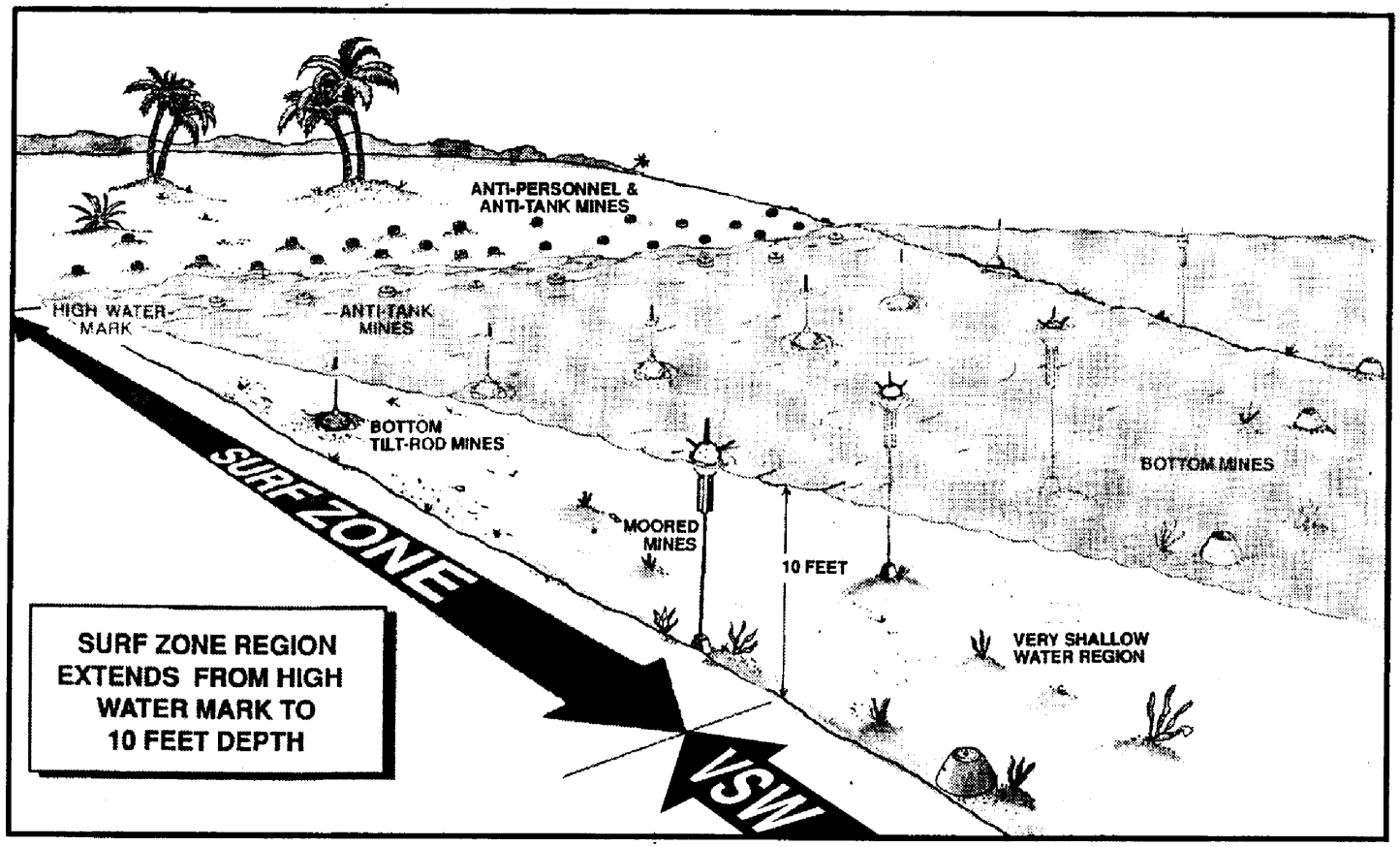
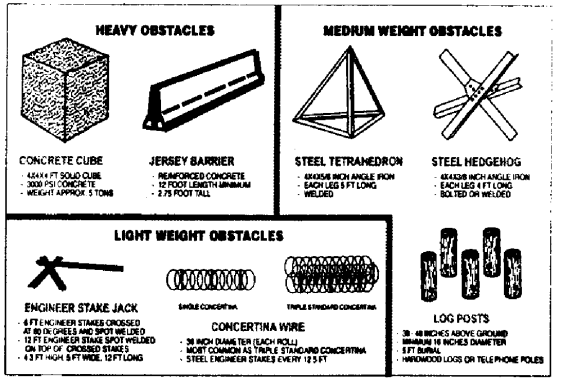
SURF ZONE AND VERY SHALLOW WATER





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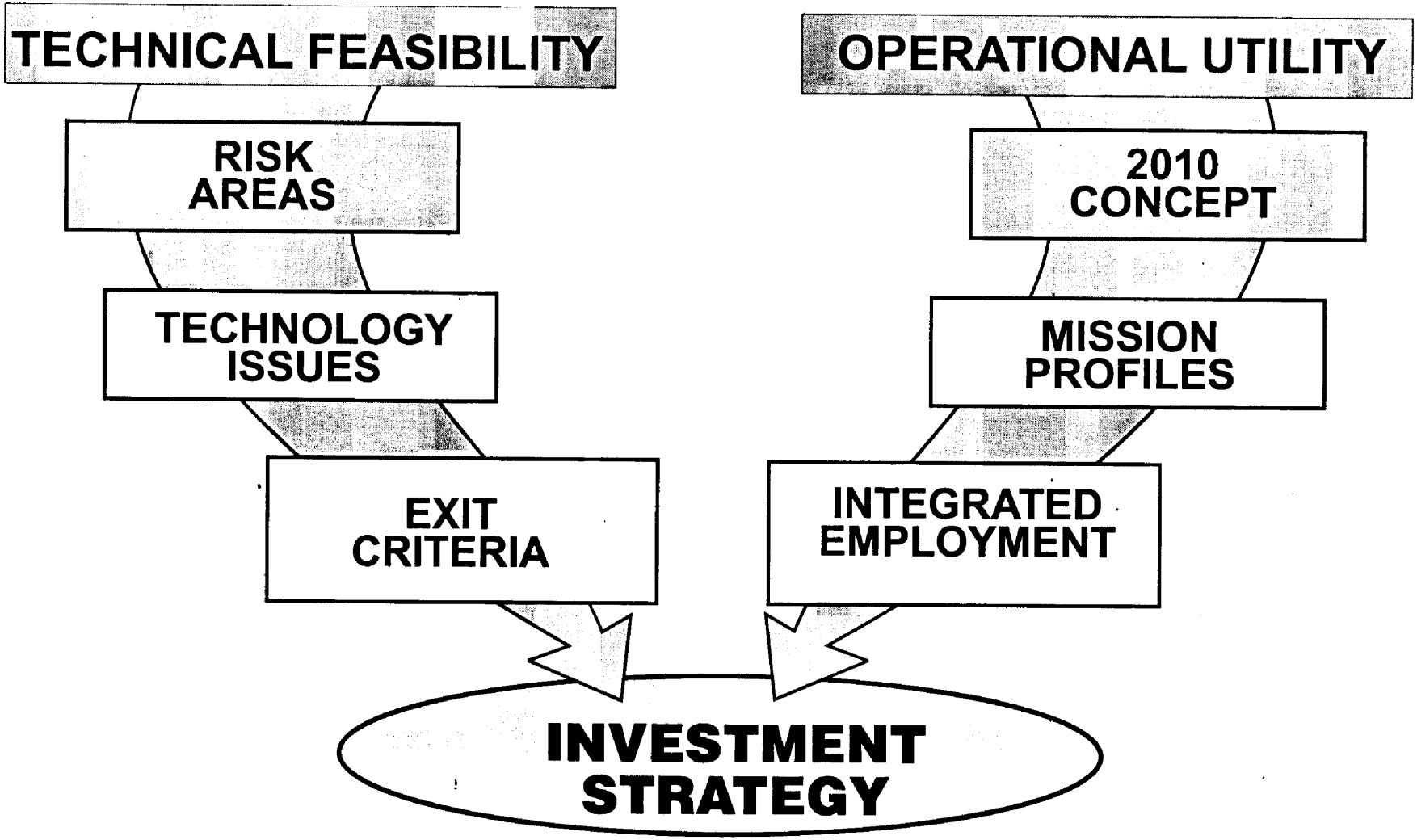
SURF ZONE TECHNOLOGY

CONCEPT-BASED ASSESSMENT



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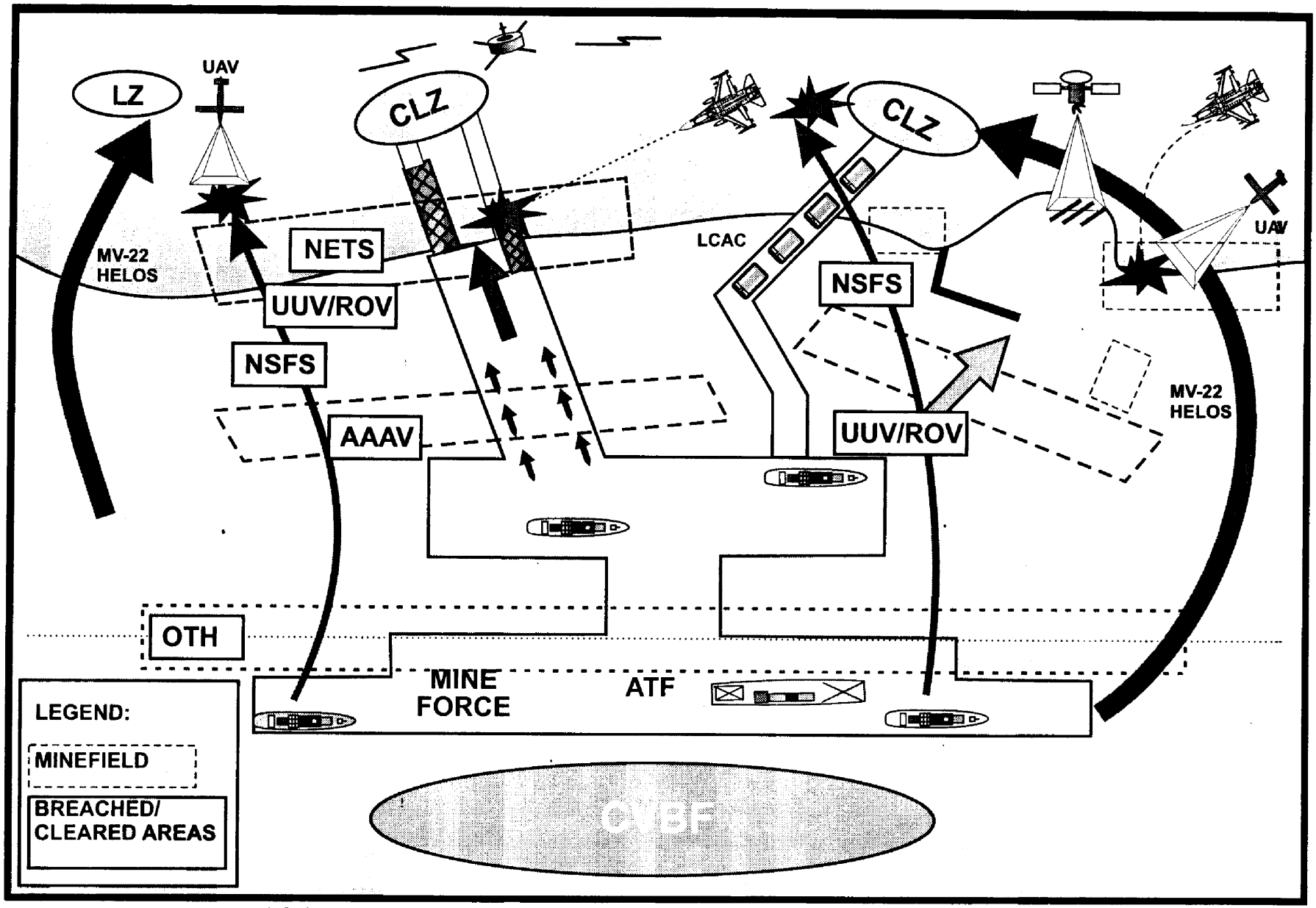
YEAR-2010
POWER PROJECTION



SURF ZONE TECHNOLOGY
MAJOR THRUSTS

- ***RECONNAISSANCE***
  - NETWORK OF AUTONOMOUS VEHICLES
  - ENABLE EXPLOITATION OF GAPS
  - MARK TARGETS AND CLEARED LANES
- ***OVER THE HORIZON DELIVERY***
  - RAPID, FLEXIBLE, LONG STANDOFF
  - AUTONOMOUS GUIDED GLIDERS
  - ELECTRONIC LANE MARKING
- ***RAPID CLEARANCE***
  - COMPUTATIONAL PREDICTIVE MODELS
  - TARGET VULNERABILITY DATA BASE
  - OPTIMIZED EXPLOSIVE EFFECTIVENESS

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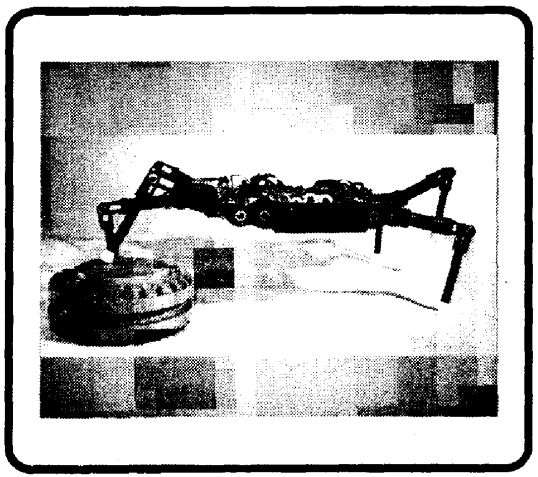
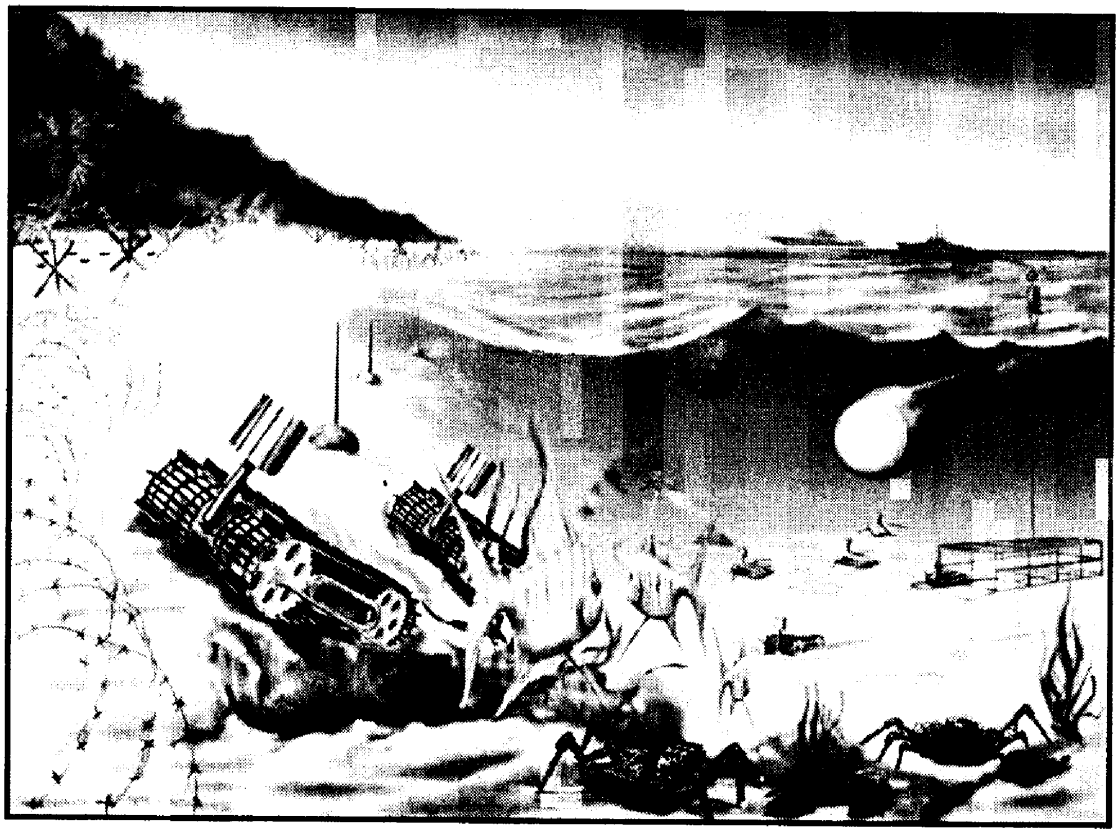
Surf Zone Technology

SURF ZONE RECONNAISSANCE



- **TECHNOLOGY ISSUES**
  - SENSING
  - NAVIGATION
  - COMMUNICATION
  - MOBILITY
- **ENVIRONMENTAL CHALLENGES**
  - WAVES & CURRENTS
  - TURBIDITY & BUBBLES
  - ACOUSTIC NOISE
  - CLUTTER

AUTONOMOUS RECONNAISSANCE AND CLEARANCE



VISION

- AUTONOMOUS OPERATIONS
- SEAMLESS THROUGH THE LITTORALS
- ENABLING OPERATIONAL MANEUVER

KEY TECHNOLOGIES

- AUTONOMOUS CONTROL / NETWORKS
- SENSORS / FUSION / ATR
- UNDERWATER & OTH COMMS
- INFO MANAGEMENT / DATA FUSION

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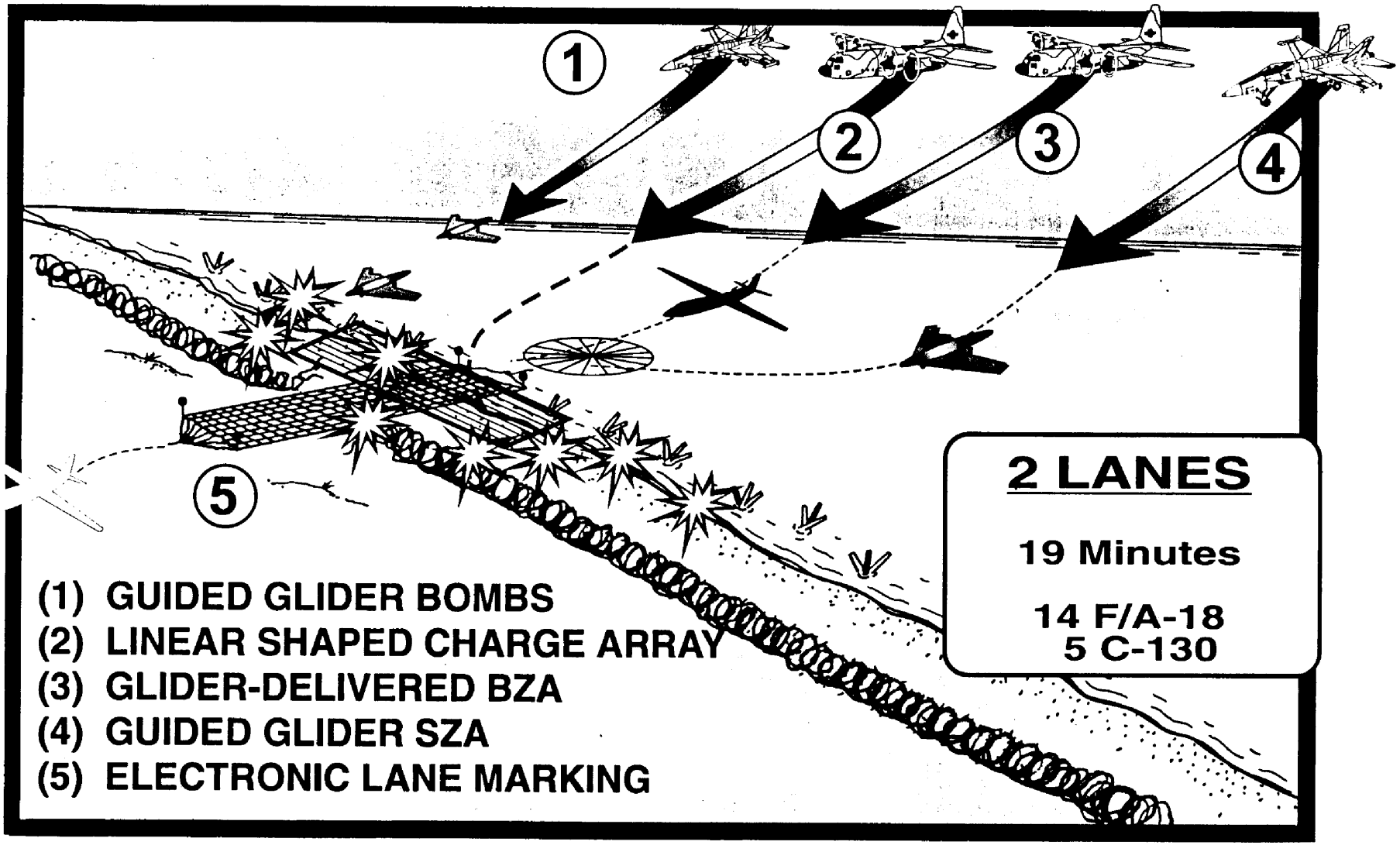
OVER THE HORIZON DELIVERY



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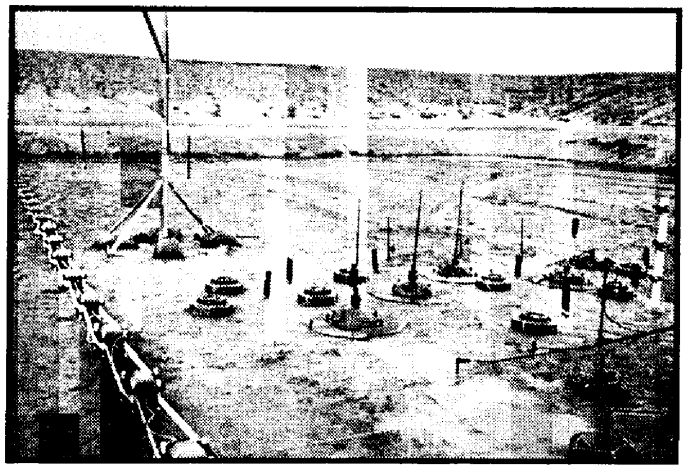
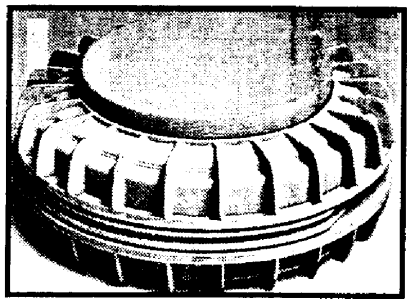
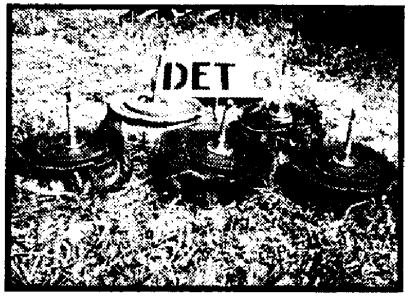
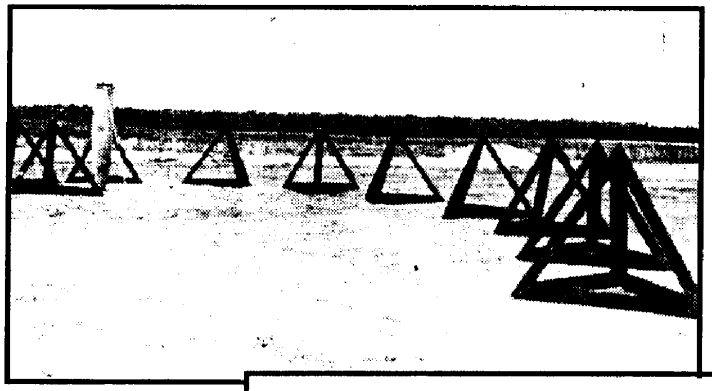
RAPID CLEARANCE

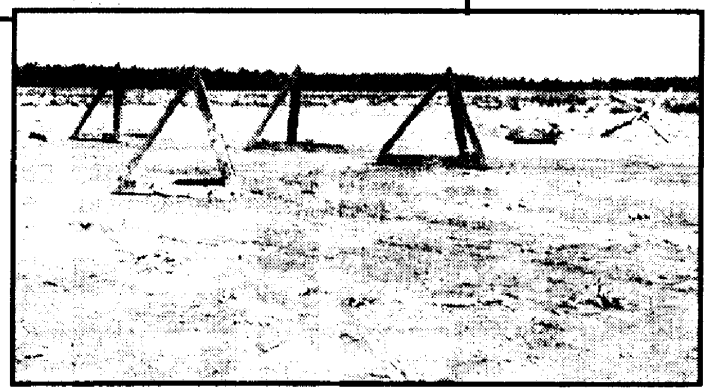
- MINE VULNERABILITY
- EXPLOSIVE PERFORMANCE
- OBSTACLE VULNERABILITY
- BOMB EFFECTS

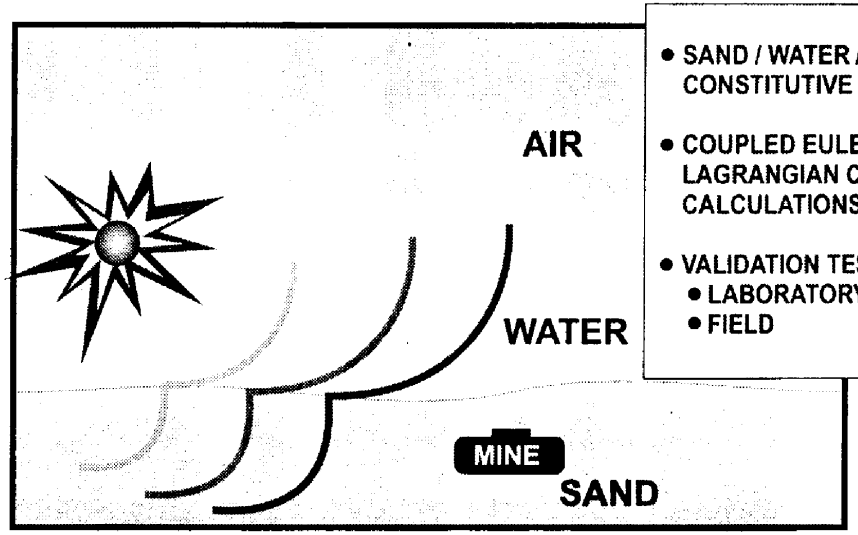












- SAND / WATER / AIR CONSTITUTIVE MODELS
- COUPLED EULER-LAGRANGIAN CODE CALCULATIONS
- VALIDATION TESTING
  - LABORATORY
  - FIELD

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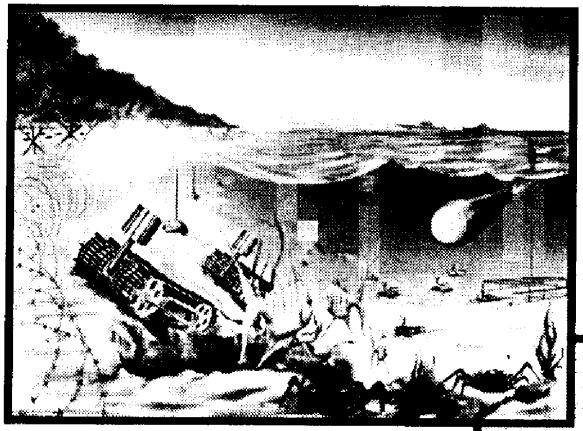
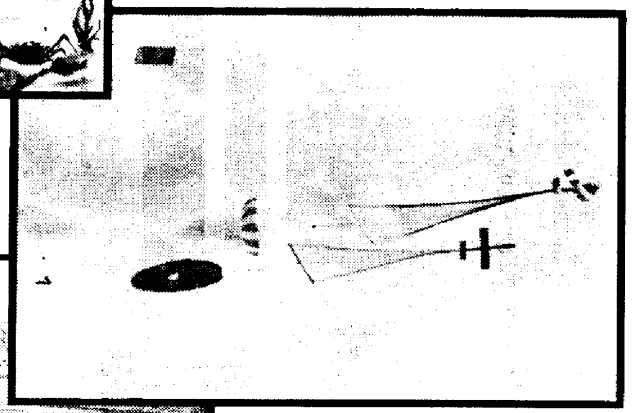
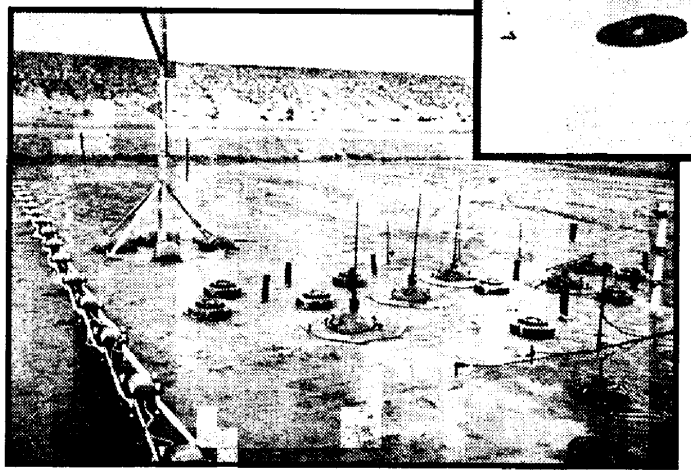
TRANSITIONS AND PRODUCTS

- *SZ RECON*
  - AUTONOMOUS NETWORKS
  - TO VSW / SZ (6.3)
- *OTH DELIVERY*
  - MAGIC CARPET
  - TO EN-ATD (6.3)
- *RAPID CLEARANCE*
  - MINE VULNERABILITY DATA
  - PREDICTIVE MODELS
  - TO ABS (6.4)







SURF ZONE TECHNOLOGY ENCYCLOPEDIA

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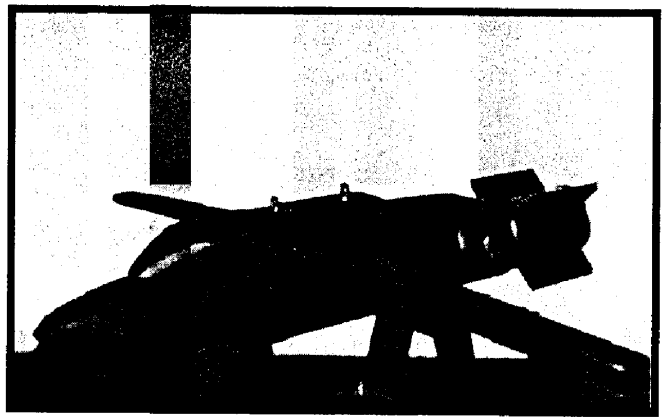
CLEARANCE
NEUTRALIZATION
RECONNAISSANCE
ANALYSIS
MISCELLANEOUS
SEARCH THE SZTE

LONGSHOT STANDOFF DELIVERY



DESCRIPTION
STRAP-ON GLIDE WING KIT

DEPLOYMENT METHOD
AIRCRAFT DELIVERED GLIDE BOMB

CATEGORY
NEUTRALIZATION

ADVANTAGES
- AIR QUALIFIED
- GOOD ACCURACY
- MINIMAL PLATFORM RISK

DISADVANTAGES
- SCALE-UP FOR LARGE MUNITIONS
- DUPLICATE EFFORT (JSOW)

SPONSOR
TOM SWEAN (703) 696-4025

POC
NEIL LEVY (760) 930-4060

STATUS
PREVIOUSLY FUNDED

RELATED PROGRAMS
STANDOFF DELIVERY
JSOW
DEPLOYABLE WING

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SURF ZONE TEAM
CURRENT 6.2 EFFORTS

GOVERNMENT

- NSWC / CSS
- NSWC / IHD
- NPS
- NRL
- AFRL / EGLIN AFB
- ARL
- SANDIA

UNIVERSITY

- U OF MARYLAND
- U OF FLORIDA

INDUSTRY

- FOSTER-MILLER
- IS ROBOTICS
- LEIGH AEROSYSTEMS
- LOCKHEED-MARTIN
- BOEING
- SRI INTERNATIONAL
- LOGICON-SYSCON
- ATR
- M-I SYSTEMS
- DATASONICS

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POTENTIAL
CONTINUUM OF CAPABILITY

- ***YEAR 2000***
  - **SABRE, DET, AND BOMBS**
  - **VSW DETACHMENT**
- ***YEAR 2005***
  - **EN-P^3I**
- ***YEAR 2010***
  - **IN-STRIDE CLEARANCE FROM OTH**

One major catalyst of change is the advancement of technology
-- Warfighting (FMFM-1)

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SURF ZONE TECHNOLOGY

- *TOUGH CHALLENGE*
  - **TRANSITIONAL REGION**
  - **CONCENTRATED THREAT**
- *PROMISING TECHNOLOGIES*
  - **AUTONOMOUS RECONNAISSANCE**
  - **OVER THE HORIZON DELIVERY**
  - **RAPID CLEARANCE**
- *HIGH PAYOFF POTENTIAL*
  - **"MAN OUT OF THE MINEFIELD"**
  - **ENABLE OPERATIONAL MANEUVER**

Daniel A. Crute
Head, Littoral Warfare Analysis Branch
Coastal Systems Station
Panama City, Florida

Mr. Daniel A. Crute serves as the Head of the Littoral Warfare Analysis Branch (Code R32) at the Coastal Systems Station, Panama City, Florida. Recently appointed to head this newly formed Branch, Mr. Crute directs the development and utilization of warfare analysis capabilities focused on current and future issues in littoral warfare.

Graduating (Summa Cum Laude) from the University of Maryland in 1982 with a bachelor of science degree in civil engineering, he received the Outstanding Senior Award from the Civil Engineering Honors Society. Initially, he worked for two years in industry, for Bechtel Power Corporation, as a structural analyst.

Beginning his career with the Navy in 1985 as a mechanical engineer at the Naval Surface Warfare Center (NSWC) in White Oak, MD, he worked as an analyst and test coordinator in the Mk 50 Torpedo program, determining warhead effectiveness against submarines. In 1988, he took on additional responsibilities, performing structural analyses on projects ranging from NASA Space Shuttle Safety System Concepts to Nuclear Blast Effects on Shipboard Radomes for Satellite Communications Systems.

In 1990, he became the lead project engineer for Torpedo Vulnerability in the Surface Ship Torpedo Defense (SSTD) Program. Planning and directing the project from start to finish, he received commendations from the US/UK SSTD Joint Project Office for exceeding customer expectations while remaining within schedule and budget.

In 1992, Mr. Crute was selected for a one-year detail at the Pentagon, working at the Mine Warfare / EOD Branch. Serving during the reorganization of the Navy staff and the establishment of the Expeditionary Warfare Division, he was responsible for all mine programs and for RDT&E programs in Airborne Mine Countermeasures. During that time, he developed plans for mine development into the 21st century.

Returning to NSWC in 1993, he became the program manager for the Surf Zone Technology program, leading.the program through a BRAC-related move to Panama City in 1995. To provide an operational context for the assessment of technologies, he directed the development of a forward-looking operational concept for amphibious and mine warfare in the year 2010. He established the Concept Assessment process, which involves warfighters in evaluating the operational utility of proposed technologies, while scientists and engineers evaluate technical feasibility. Under his leadership, several technologies have transitioned from exploratory development (6.2) to advanced development (6.3), and a comprehensive investment strategy has been developed.

Mr. Crute has written technical publications, articles, and concept papers, including recent papers entitled *Surf Zone Technology – Enabling Operational Maneuver From the Sea* and *Naval Mine Warfare Vision 2010 – A View Toward the Future.* He was selected to lead the Littoral Warfare Analysis Branch in October 1998. He lives in Panama City, Florida, with his wife and two sons.